

REMARKS

Claims 1-22 were pending. Claims 1-22 have been amended for clarity and consistency. Claims 23-36 are new. Claims 1-36 are pending.

The title has been amended in response to the request in the Office Action. The specification has been amended to address concerns raised in the Office Action. Applicant also has corrected additional inconsistencies and clerical errors uncovered by a thorough review of the specification. Drawing corrections to FIGS. 3B and 6B are submitted.

Applicant agrees with most of the concerns raised in the Office Action, but notes respectfully that not all suggestions have been followed. For example, the statement in paragraph [0057] that “the third predetermined constant voltage V3” remains unchanged. The statement is consistent with the previous description related to FIG. 5. Applicant also notes that the inequalities in FIGS. 3B and 6B have been changed for consistency with the specification. Applicant understands the concerns raised with respect to paragraphs [0063] and [0064]. Instead of relocating or removing these two paragraphs, however, paragraph [0062] has been deleted and inserted as paragraph [0041.1] so as to provide a more appropriate arrangement of the description. Paragraph [0072] has been deleted and inserted as paragraph [0066.1] for similar reasons. In paragraph [0073], “smaller than” has been change to --no greater than-- for consistency when referring to Vb and the first and second constant voltages, and prevention of the problem of a pre-mature start of the pulse charge process.

The Office Action advances objections to claims 1-22 based on informalities. More specifically, the Office Action requires that the term “second battery” appearing in the claims should be replaced with “secondary battery.” Applicant has revised the claims to change “second battery” to --battery--. Applicant respectfully urges that inserting the term --secondary-- would render the claims inconsistent with the written description. The term “second battery” is used consistently throughout the specification, including in the title of the invention. The term “secondary battery” appears nowhere in the application. Withdrawal of this objection and requirement for correction respectfully is solicited.

The Office Action contains objections to Claim 3-8 and 10-12 because the term “a third constant voltage” is used without a prior recitation of first and second constant voltages. Applicant respectfully notes, however, that the terms first, second, and third constant voltages as used in the claims are consistent with their use in the specification. Withdrawal of the objection is requested.

Claims 11 and 12 have been amended to replace “signal” with --single--. Similar corrections also have been made in the specification.

Claims 3 and 16-18 stand rejected under 35 U.S.C. § 112, second paragraph based on indefiniteness. The claims have been amended to address these concerns, and are submitted as particularly pointing out and distinctly claiming the invention.

Claims 1-3, 10, 15, and 16 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Pat. No. 5,710,506 to Broell et al. Applicant respectfully requests reconsideration of this rejection.

Claim 1 recites a battery charging apparatus which charges a battery. The battery charging apparatus includes, *inter alia*, “a voltage detecting circuit arranged and configured to detect a battery voltage of said battery and for outputting a signal in response to a detected battery voltage,” “a current detecting circuit arranged and configured to detect a charging current supplied to said battery and for outputting a signal in response to a detected charging current,” and “a charging circuit arranged and configured to control said charging current such that said detected battery voltage increases to become substantially equal to a first pre-set voltage in response to a first input control signal.”

Broell et al. discloses a battery-charging circuit in which a gradient determination device detects a decrease over time in a battery voltage. A charge-modification command is generated in response to a detected decrease in battery voltage. Broell et al. does not teach or suggest “a charging circuit arranged and configured to control said charging current such that said detected battery voltage *increases* to become substantially equal to a first pre-set voltage in response to a first input control signal.” Broell et al. does not anticipate claim 1. Claims 2, 3,

and 10 depend directly or indirectly from claim 1 and are patentable over Broell et al. for at least the same reasons.

Claim 15 recites a charging method for a battery. The method includes, *inter alia*, “performing a first constant current charging by supplying a first constant current to the battery when a battery voltage of the battery is smaller than a first pre-set voltage” and “performing a second constant current charging by supplying a second constant current greater than the first constant current to the battery when the battery voltage of the battery is greater than the first pre-set voltage” A pulse charging of the battery takes place “when the battery voltage of the battery increases to become equal to or greater than a second pre-set voltage greater than the first pre-set voltage.”

Broell et al. discloses modification of a battery-charging operation based on a detected *decrease* in battery voltage. Broell et al. does not anticipate the invention of claim 15 in which pulse charging of the battery takes place “when the battery voltage of the battery increases to become equal to or greater than a second pre-set voltage greater than the first pre-set voltage.” Claim 15 is patentable over Broell et al. Claims 17 and 18 depend indirectly from claim 15 and are patentable over Broell et al. for at least the same reasons.

Claims 4, 5, 13, 14, 17, 21, and 22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Broell et al. in view of U.S. Pat. No. 5808446 to Eguchi. Applicant respectfully requests reconsideration of this rejection.

Claims 4, 5, 13, and 14 depend directly or indirectly from claim 1. Claim 1 is patentable over Broell et al., as advanced above. Eguchi has not been cited against claim 1. Eguchi has been cited as providing a battery-charging method in which over-charging of the battery is prevented by switching from constant-current charging to constant-voltage charging when a full-charge voltage is attained. As noted above, however, Broell et al. modifies a charging operation based on a decrease in battery voltage. Eguchi and Broell et al. teach away from each other with respect to charging-operation control. Consequently, Eguchi can not be combined with Broell et al. to provide “a charging circuit arranged and configured to control said charging current such that said detected battery voltage *increases* to become substantially equal to a first pre-set

voltage in response to a first input control signal.” Claims 1, 4, 5, 13, and 14 are patentable over the proposed combination of Broell et al. in view of Eguchi.

Claims 17, 21, and 22 depend directly or indirectly from claim 15. Claim 15 is patentable over Broell et al., as advanced above. Eguchi has not been cited against claim 15. Eguchi has been cited as providing a battery-charging method in which over-charging of the battery is prevented by switching from constant-current charging to constant-voltage charging when a full-charge voltage is attained. As noted above, however, Broell et al. modifies a charging operation based on a decrease in battery voltage. Eguchi and Broell et al. teach away from each other with respect to charging-operation control. Consequently, Eguchi can not be combined with Broell et al. to render obvious the invention recited in claim 15. Claims 15, 17, 21, and 22 are patentable over the proposed combination of Broell et al. in view of Eguchi.

Claims 9 and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Broell et al. in view of U.S. Pat. No. 6,452,364 to Saeki et al. Applicant respectfully requests reconsideration of this rejection.

Claim 9 depends from claim 1. Claim 1 is patentable over Broell et al. as advanced above. Saeki et al. has not been cited against claim 1. Saeki et al. has been cited as providing a charge-end detecting circuit. Saeki et al. discloses a charging device that operates in a manner substantially opposite to that of Broell et al. Moreover, the modifications necessary to correct the deficiencies of Broell et al. would destroy the Broell et al. invention. Saeki et al. can not be used to modify Broell et al. to operate in a manner contrary to the teachings of Broell et al. Claim 1 is not anticipated or rendered obvious by the proposed combination of Broell et al. in view of Saeki et al. Claims 1 and 9 are patentable over Broell et al. in view of Saeki et al.

Claim 20 depends from claim 15. Claim 15 is patentable over Broell et al. as advanced above. Saeki et al. has not been cited against claim 15. Saeki et al. has been cited as providing a charge-end detecting circuit. Saeki et al. does not and can not modify Broell et al. to

operate in a manner contrary to the teachings of Broell et al. Claim 15 is not anticipated or rendered obvious by the proposed combination of Broell et al. in view of Saeki et al. Claims 15 and 20 are patentable over Broell et al. in view of Saeki et al.

New claims 23-36 have been added. Examination of claims 23-36 respectfully is requested.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

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Respectfully submitted,

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Attachments

AMENDMENTS TO THE DRAWINGS

The attached sheets of drawings include changes to FIGS. 3B and 6B for consistency with the written description, as follows:

FIG. 3B has been changed to correct the inequality in Step S12. The inequality has been changed from “ $ib \leq i3$ ” to $--ib < i3$.”

FIG. 6B has been changed to correct the reference “ST12” to $--S12--$. Also, the inequality in Step S12 has been changed from “ $ib \leq i3$ ” to $--ib < i3$.”

Attachment: Replacement sheets
 Annotated sheets showing changes

ANNOTATED SHEET SHOWING CHANGES

The two annotated sheets attached show changes to FIGS. 3B and 6B.

FIG. 3B

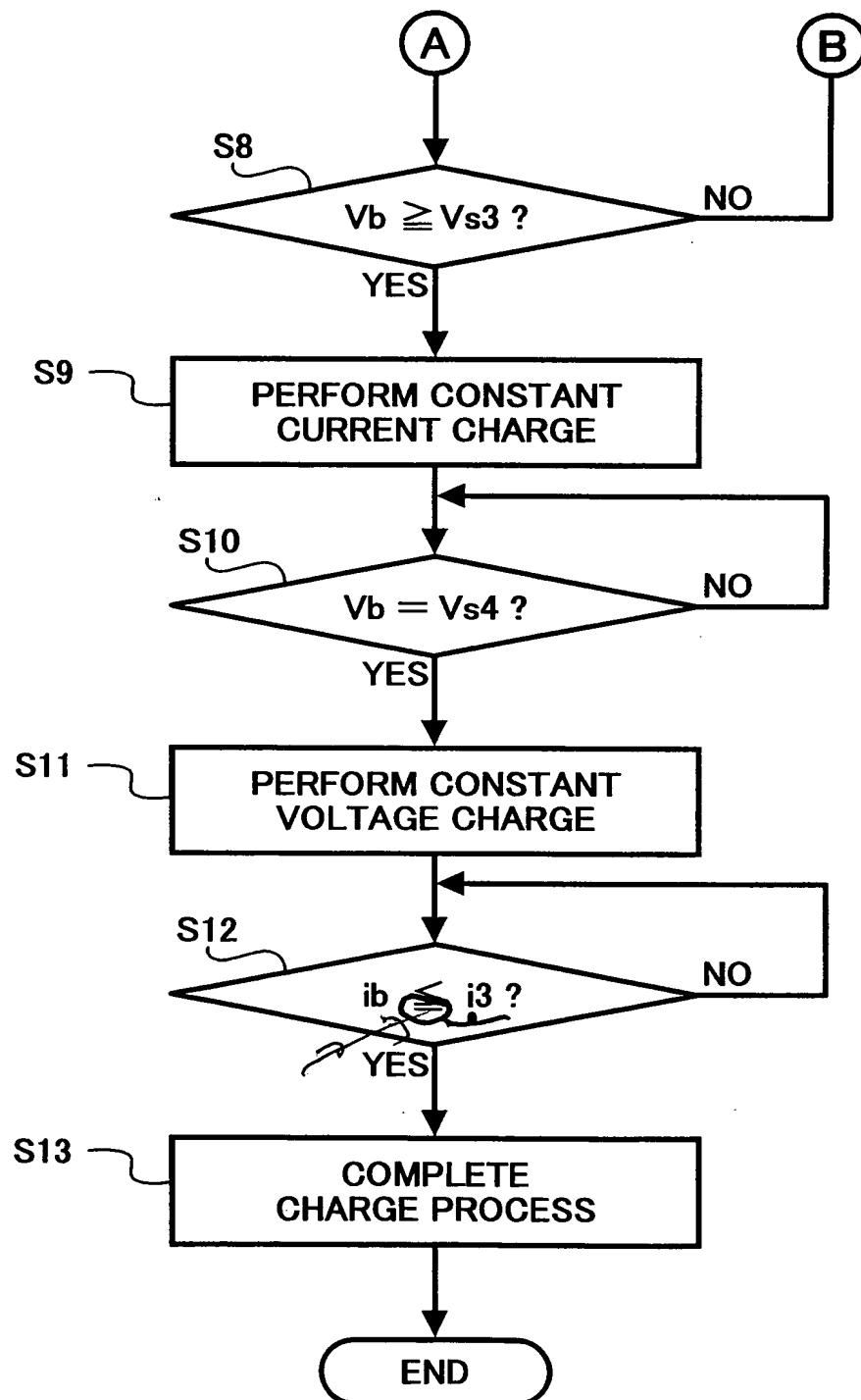


FIG. 6B

